BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769.	R.14-08-013 (filed August 14th, 2014)

COMMENTS OF GREEN TECHNOLOGY LEADERSHIP GROUP REGARDING DISTRIBUTION RESOURCES PLAN DRAFT GUIDELINES

FOR GREEN TECHNOLOGY LEADERSHIP GROUP

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Dated: December 12, 2014

The Green Technology Leadership Group (GTLG), a nonprofit organization focused on developing innovative energy policies with industry and public sector leaders, appreciates the opportunity to submit comments regarding D.14-08-013. We appreciate the Commissions' inclusion of our report in Appendix B in the initial proceeding docket titled "More than Smart: A Framework to Make the Distribution Grid More Open, Efficient and Resilient", or MTS. The levels of distributed energy resources (DER) envisioned in current California policy, including Assembly Bill 32 (Nunez) and Assembly Bill 327 (Perea), requires a bold new comprehensive plan for upgrading our distribution grid—we believe this proceeding is the appropriate path for guiding this change.

Since August, GTLG has cooperated with Caltech to complete a series of working group meetings to provide an open, voluntary stakeholder forum to discuss core issues toward finding common ground regarding the evolution of California's distribution system and the seamless integration of DER to meet customers' needs and public policy. The results of the discussions are for the benefit of the participants with the objectives to:

1. Define common parameters for the development of distribution planning scenarios for utilities to properly stress test plans and to achieve a measure of comparability among different DRP's;
2. ID and define the integrated engineering-economic analysis required to conduct distribution planning in the context of AB 327 requirements;
3. Define the potential grid end-states in the context of existing roadmas and identify the considerations regarding grid evolution to meet customers' needs and California's policy objectives; and
4. Define the scope and parameters of an operational/DER market information exhcnage to facilitate and open planning process and enable R&D efforts.

We have held 9 meetings since August on this topic with over 40 separate entities participating in our meetings. Attached is a summary presentation on the meetings, members and findings from these meetings that we hope will be considered in the CPUC's proceeding. The D.14-08-013 proceeding is the perfect convening tool for creating a framework for upgrading a new distribution grid for California and to identify technologies and services that can expedite California's push for more DER. GTLG will work closely with CPUC and other stakeholders to develop concrete recommendations and principles for distribution grid planning, design build, operations and integrating DER into operations to create a more open, efficient and resilient grid.

Thank you for your consideration.

Dated: December 12th, 2014

Respectfully submitted,

FOR GREEN TECHNOLOGY LEADERSHIP GROUP

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More Than Smart Working Group

Summary of Key Discussion Topics and Conclusions

December 2014

Paul de Martini
Tony Brunello

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Caltech RESNICK INSTITUTE

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- Distribution Planning Market & Operational Data Types and Sharing Process
- DER Planning Process in relation to other planning processes

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Introduction

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More Than Smart Introduction

Green Technology Leadership Group

- GTLG is a California 501(c)(3) non profit organization focused on bringing industry and policy-makers together on cutting edge environment and energy topics.
- GTLG's "More than Smart" effort has been focused on leading non profits, industry and government leaders to identify how to integrate more DER into CA more quickly. Funded by The Energy Foundation and MTS WG participants.
- Participation is open for all MTS efforts and is encouraged. MTS way is only one recommended path. All participants to MTS events can be found at **www.greentechleadership.org**

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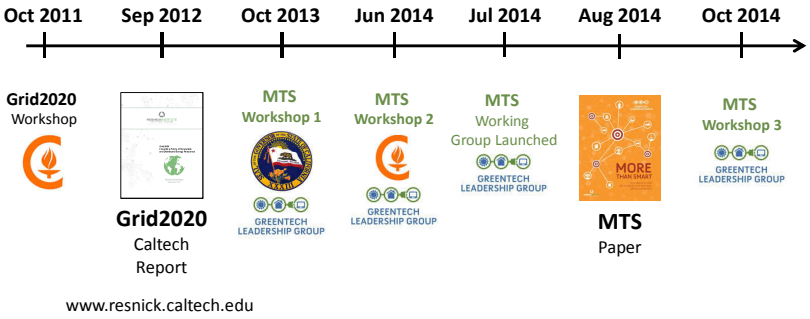
More Than Smart Evolution

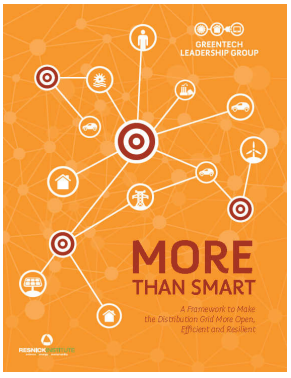
Discussion of a holistic systems engineering approach to enable scaling renewable and distributed resources in California began at Caltech-Resnick Institute ***Grid2020*** workshop in Fall 2011 – this provided a foundation for the ***More Than Smart*** effort



www.resnick.caltech.edu

More Than Smart Paper Overview

- Purpose:
  - Continue the dialog on the evolution of CA's power system focusing on its role & attributes to enable customer benefits and public policies related to cleaner and distributed resources
- Participants:
  - Developed originally from MTS workshop 1 (~75 people) discussion notes
  - Further refined by feedback from a subset of people (~20) representing a cross section of stakeholders
- Paper:
  - Focus on distribution system holistically from a full lifecycle perspective
  - Broader than PUC 769 scope to explore the interrelationship to other aspects of distribution and interrelationship to customers, DER development, markets, & transmission
  - Provide a framework for the many aspects to consider in development and operation of an enabling distribution platform for customer participation and DER at scale



Key Takeaways

- Distribution planning should start with a comprehensive, scenario driven, multi- stakeholder distribution planning process (DPP) to address locational benefits and costs of distributed resources.
- This DPP is enabled by a standardized set of methods and analytical models based on a combination of utility grid operational data and DER market development information in sufficient detail to achieve desired results.
- California's distribution system should continue to evolve towards an open and flexible "node-friendly" system that enables seamless DER integration.
- Flexible DER can provide a wide range of value across the bulk power and distribution systems. New services and performance criteria should be identified as part of the distribution planning process.
- Utility Distribution System Operators (DSOs) need to evolve their roles to provide safe and reliable electric service across the distribution system and operational boundaries, while also enabling seamless integration of DER and microgrids into markets and grid operations.

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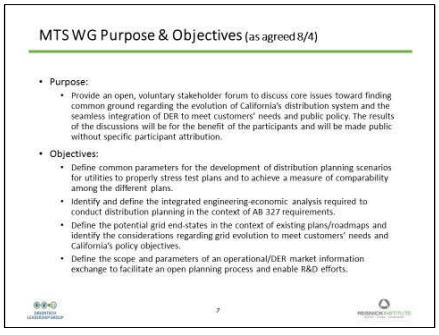
MTS Working Group

- Purpose:
  - Group at Caltech workshop 2 felt that the open dialog of the technical and detailed issues was a useful activity to facilitate discussion of the many detailed technical/process issues and explore potential areas of common ground
- Structure:
  - Facilitated working group that is open to any stakeholder (currently ~50)
  - Discussion notes are produced and made available without individual attribution (Chatham House Rules)
  - Summary notes on points of common ground will be published on GTLG website
  - Participants are free to use materials as desired



MTS WG Purpose & Objectives (as agreed 8/4)

- Purpose:
  - Provide an open, voluntary stakeholder forum to discuss core issues toward finding common ground regarding the evolution of California's distribution system and the seamless integration of DER to meet customers' needs and public policy. The results of the discussions will be for the benefit of the participants and will be made public without specific participant attribution.
- Objectives:
  - Define common parameters for the development of distribution planning scenarios for utilities to properly stress test plans and to achieve a measure of comparability among the different plans.
  - Identify and define the integrated engineering-economic analysis required to conduct distribution planning in the context of AB 327 requirements.
  - Define the potential grid end-states in the context of existing plans/roadmaps and identify the considerations regarding grid evolution to meet customers' needs and California's policy objectives.
  - Define the scope and parameters of an operational/DER market information exchange to facilitate an open planning process and enable R&D efforts.

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More than Smart Working Group Participants

- Green Technology Leadership Group
- Newport Consulting
- ICF International
- California Independent System Operator
- Pacific Gas & Electric
- Southern California Edison
- San Diego Gas & Electric
- Sacramento Municipal Utility District
- Burbank Water and Power
- Solar City
- DECA Power
- Environmental Defense Fund
- Cal SEIA
- Clean Coalition
- Center for Sustainable Energy
- Lawrence Berkeley National Laboratory
- Caltech
- SunPower
- UC CIEE
- Eaton
- Varentec
- Northern California Power Association
- UC Davis Energy Institute
- USD Energy Policy Initiatives Center
- Rocky Mountain Institute
- Inovus Solar
- California Energy Storage Alliance
- Integral Analytics
- Marin Clean Energy
- Qado Energy
- Electric Power Research Institute
- NRG
- Better Energies
- NextEra Energy
- Energy Foundation
- Siemens
- Energy Center
- GridBright
- Strategy Integration
- Energy Foundation
- Petra Systems
- Independent Advocates
- GridCo

Chronology of WG Meetings & Discussion Topics

- August 4th Meeting – Conference Call
  - Determine the More than Smart Working Group purpose, scope, and schedule
- August 25th Face-to-Face Meeting – San Francisco
  - Define the "Current Path" and "Grid as Network" end-states;
  - Identify Scenarios and Assumption Parameters for Distribution Planning Process
- September 15th Meeting – Conference Call
  - Follow-up discussion regarding end-states;
  - Distribution Planning Process & Scenario Planning Parameters;
- September 23rd Face-to-Face Meeting – San Diego
  - Follow-up on Distribution Planning Process and Scenario;
  - Integrated Distribution Analysis Framework – Scope of DER Integration Capacity;
- October 14th Meeting – Conference Call
  - Identify linkages of Distribution Planning Process with other California Planning Processes
- October 27th & 28th Face-to-Face Meeting – Los Angeles
  - Integrated Distribution Analysis Framework – Scope of DRP Optimal Location Analysis
  - Integrated Distribution Analysis Framework – Operational & DER Market Data
  - Follow-up on Alignment and Linkages with California Planning Processes
- November 12th Meeting – Conference Call
  - Follow-up on Integrated Distribution Analysis Framework – Scope of Operational and Market Data
- November 18th Face-to-Face Meeting – San Francisco
  - Integration Capacity Analysis
  - Optimal Location Analysis and Benefits Analysis
- December 9th Face-to-Face Meeting – San Francisco
  - Follow-up on Optimal Location Analysis and Benefits Analysis Methods
  - Follow-up on Alignment and Linkages with California Planning Processes

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Evolution of the Distribution Grid

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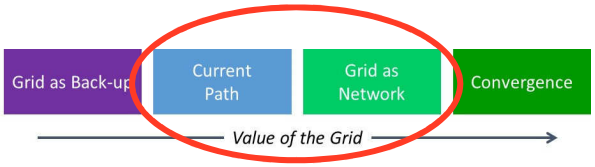
Foundational Distribution End-States:
Current Path & Grid as Network

- Initial focus on assessing Current Path and Grid as an Open Platform



Current Utility Path

More Reliable & Safe + Greater Capacity for DER Interconnection

- Guiding principle of creating a safer, more reliable distribution system enables greater integration of distributed energy resources (DERs).
- Distribution system refresh underway is increasing integration ("hosting") capacity
  - Continued replacement of aging electric infrastructure
  - Refresh involves upgrading to higher voltage levels in areas with high DER potential
  - Streamlining inventory has standardized on fewer distribution components with slightly larger sizes for wire and transformers, for example
- More Resilient/Reliable/Safe & Visible
  - Extending distribution automation to improve fault isolation and service restoration capabilities
  - Continued upgrades on distribution protection systems (substation communications and analog to digital relays)
  - Integration of field sensors (smart meters, other sensors) into grid operational systems that enable situational intelligence
  - Digitization of field asset information (completing the analog to digital transition)

Grid as Open Platform

- Viewing the grid as a platform opens up a number of new opportunities to allow for more DER resources, and to better utilize the grid and its components.
- "Platform attributes"
  - Enable multi-directional real & reactive power flows
  - Enable transactions across distribution with utility distribution company (UDC), bulk power operations and wholesale market
  - Physical and operational qualities that yields "network effects" – that is greater customer/societal value from the distribution system for each interconnected DER
- "Node-friendly"
  - Capabilities to integrate DER at levels envisioned in California
  - "Open":
    - Low barriers to access physical connections & value monetization opportunities
    - Streamlined/simplified interconnection rules and processes
  - "Transparent"
    - Processes for distribution planning, interconnections, and operations
    - Access to distribution planning & operational information (qualified access)
    - Locational value determination and monetization

Note: This end-state concept is similar to the DSP infrastructure discussed in New York's REV proceeding. This is also referred to as a grid as a network.

"Least Regrets" Investments

UDC Investments that are fundamental elements of a modern distribution system and necessary to enabling large scale DER integration and value monetization

- Real-time grid sensing
  - Smart metering can provide planning level information regarding load and power quality characteristics (historical 15min or hourly information)
  - Distribution grid sensors (e.g., fault current indicators, phasor measurement units, other sensors) are needed for real-time state information on the distribution system
  - Customer-side DER sensors/measurements devices are needed to augment grid state information, but are not sufficient alone to operate an increasingly stochastic (randomly variable) distribution system.
- Field area communications infrastructure
  - Distribution substation operational telecommunications
  - Field area operational telecommunications network to enable real-time protection and distributed controls
- Situational Intelligence, Grid Optimization and Distributed Controls
  - Situational intelligence systems that integrate various internal and external asset and operational information to create real-time grid state
  - Grid optimization systems that combine grid state with power engineering-economic analytics to support real-time operational decisions
  - Distributed control systems to manage distribution reliability, power quality and integration with bulk power system, for example:
    - Volt/VAr Optimization
    - Distributed Energy Resource Management System (DERMS)

Distribution Planning Process

Distribution Resource Planning in Context

- 80+% of distribution feeder level investments are planned and deployed on 1-2 year cycles
  - For example, Circuit upgrades, equipment (e.g., transformers, switches) replacements & reconductoring
- Substation and system-wide technology deployment planning horizon bet 5-7 years
- Distribution Planning Areas (DPA) are dissimilar among the CA IOUs in terms of distribution system scope and relationship to transmission system
- DPAs are associated with specific Transmission Planning Areas (TPA)
- IOU Distribution system planning criteria adequately addresses reliability and safety and should be a foundational basis for DRP analysis
- DER Planning Issues
  - Lack of locational information regarding DER behind the meter
  - Load forecasts from CPUC/CEC are insufficiently granular to a substation/feeder level

Distribution Planning Process (DPP)

- Two step approach given the short time between ruling and statutory deadline of July 1, 2015
- Focus 2015 DRP on:
  - Identifying DER integration capacity, and
  - Prototyping locational benefits analysis for one (1) Distribution Planning Area within each IOU
  - Refine stakeholder engagement model
- Ongoing DPP
  - Annual distribution system capacity updates
  - Bi-annual DRP to include system-wide Location Benefits analysis at the substation level aligned with IEPR/LTTP/TPP processes

Distribution Resource Plan Analyses

Analysis	Action	Scope	Granularity	Timing	Data Req'd
Integration Capacity • Existing, available distribution capacity for DER interconnections • 2yr Snapshot-in-time view that also reflects IOU investment plans	• Power flow analysis per feeder • Utility to communicate via modified RAM maps	**2015 & Ongoing:** • All distribution feeders	• Feeder level • 2yr outlook	• Every year	• Tbd by WG

Optimal Locations
• 10yr Scenario driven analysis
  • Trajectory
  • High DER
  • Preferred Resources
• Based on distribution capacity & operational services, transmission capacity, generation capacity & energy, BPS ancillary services, environmental, and other avoided costs/benefits
• Planning assumptions linked with CPUC/CEC/IEPR/LTPP/TPP planning
	• Utility investment plans in GRCs and other reflect DER alternatives based on scenario driven locational benefits analysis
	• Consider customer DER growth rates independent of central planning
	• Utility to procure DER services via programs, tariffs, RFOs, etc.
	• Utility to identify optimal locations via RAM type maps
		2015:
		• One (1) Distribution Planning Area
		
		Ongoing:
		• System-wide beginning in 2017
			• Substation level by DPA
			• 10 yr outlook
				• Every 2 years	• Tbd by WG

2015 DRP

- System-wide DER integration capacity assessment
  - Feeder level DER integration capacity
    - Engineering analysis based on specific locational (load/DER/feeder) information, not "15% rule" heuristics, recognizing that the unique characteristics of each feeder will determine the capacity to integrate DER
    - Continue to use existing distribution system planning criteria and guidelines, including capacity to support "1-in-10" year heat event and withstand N-1 scenario (loss of critical substation transformer or circuit)
  - Revise Renewable Auction Mechanism (RAM) maps to convey distribution system capacity for DER integration
    - Modified RAM maps are convenient means to communicate capacity availability
    - Current maps use 15% heuristics and will need to be revised based on engineering analysis largely completed by IOUs
- Locational benefits analysis for one Distribution Planning Area (DPA) as defined uniquely by each IOU
  - Validate DRP methodology and processes (see slide)
  - Use as prototype for bi-annual DRP process
  - Use to prototype stakeholder feedback on process and results

Ongoing DRP

- Annual updates to feeder level DER integration (hosting) capacity
  - IOUs can provide annual updates to feeder capacity and publish via modified RAM maps
  - As in 2015, the engineering analysis will be more sophisticated and will not be based on the 15% Rule
- Bi-annual DRP aligned with broader CA planning
  - 10 year scenario driven system-wide locational benefits analysis
  - Locational benefits conducted at the distribution substation level
  - Planning assumptions linked to CPUC/CEC/CAISO and IEPR/LTPP/TPP/IDSM planning
  - Bi-annual DPP Process timing aligned with CA Joint Agency planning schedules

Ongoing DPP: Annual DER Capacity Updates

Provide annual updates via modified RAM maps on feeder capacity to integrate DER

- Distribution system is changing annually on multiple dimensions:
  - Aging infrastructure replacement
  - Grid modernization investments (incl. Smart gird)
  - Circuit reconfigurations
  - DER diffusion
  - Gross load profiles
- Update feeder level engineering analysis to determine the capacity of each feeder/substation to integrate DER
  - Use criteria and methods from 2015 DRP
- Leverage Renewable Auction Mechanism (RAM) maps to convey distribution system capacity for DER integration
  - Modified RAM maps are convenient means to communicate capacity availability

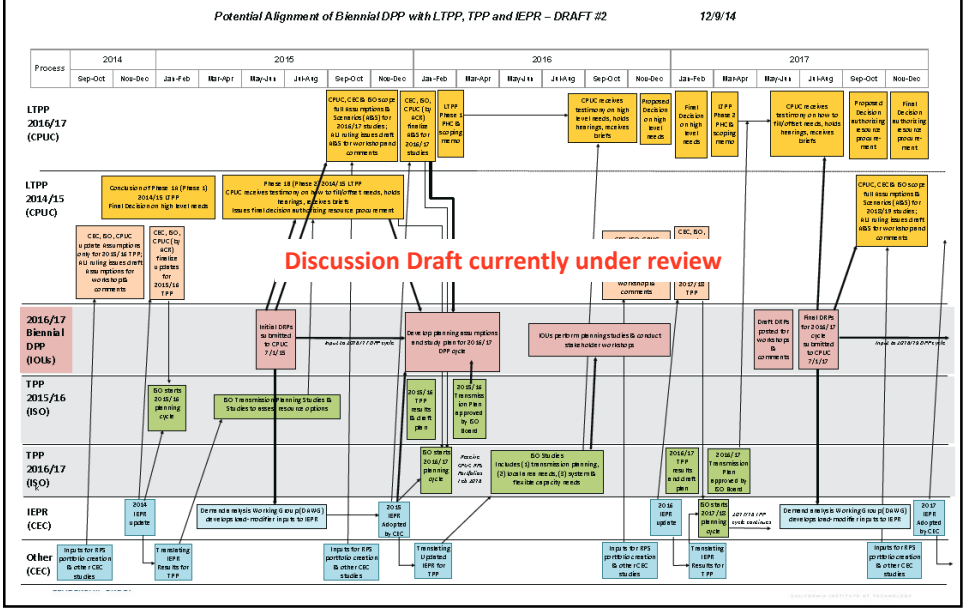
Bi-annual DPP Alignment w/CA Planning

- 10 year scenario driven system-wide locational benefits analysis
  - 3 scenarios: 1) variant of LTPP "Trajectory" case, 2) "High DER" adoption due to customer choice, and 3) expanded preferred resources case driven by policy and system needs
- Locational benefits conducted at the distribution substation level
  - Feeder level is too granular as the engineering options are considered at the distribution substation level for time periods >2 years
  - Net benefit of deferral of traditional capital investment
  - Net benefit of DER provided operational services (voltage, reactive power, etc.)
- Planning assumptions linked to CPUC/CEC/CAISO and IEPR/LTPP/TPP/IDSM planning for consistency, but:
  - Data and forecasts need to be more granular and linked to distribution locational value
- Bi-annual DPP Process timing aligned with CA Joint Agency planning schedules

DPP Process Alignment for CPUC, CAISO, CEC

- The new DPP should align with the LTPP-TPP-IEPR timeline
- Main points to consider:
  - When is it optimal to have a new DRP, i.e., the final result of the biennial DPP, to feed into the other processes? That is, where on the alignment timeline do we want the DPP to conclude?
  - What are the key process steps of the DPP, what is the sequence in which they must be performed, and what inputs do they require from other processes?
  - Concurrent biennial IOU DRPs would be most effective for statewide planning alignment.
- Currently, first DRP due in July 2015. If July 2017 is the next deadline then:
  - DRP would provide useful and timely input to the IEPR demand forecast, which is planned to be released in draft form in September 2017 and finalized by December 2017.
  - Likely that July 2015 DPR will not be as informative for the 2015 IEPR, still we should consider to what extent it will inform that forecast.
  - CPUC, CECS, and CAISO will collaborate between September-December 2017 to develop "assumptions and scenarios" for TPP and LTPP for cycles beginning in January 2018.

DPP Alignment with CPUC, CAISO, CEC Planning



Integration Capacity Analysis Framework

Currently under discussion

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Integration Capacity (aka "hosting" capacity)

- Integration capacity primarily refers to DER that can be accommodated on a given feeder without impacting reliability of power quality. It can refer to any DER, not just solar PV.
- Integration capacity depends on: size of the system, feeder characteristics and the location.
- Integration capacity could increase significantly depending on the mix of DER and smart inverters.
- It is important to develop a streamlined methodology to analyze hosting capacity on a distribution feeder annually.
  - Given the large number of distribution feeders across the territories of the three IOUs, for 2015 a method to triage feeder analysis employing reference feeder archetypes to narrow the number of feeders requiring individual detailed analysis.
  - Going forward, process and methods proposed by EPRI and IREC could be adapted.

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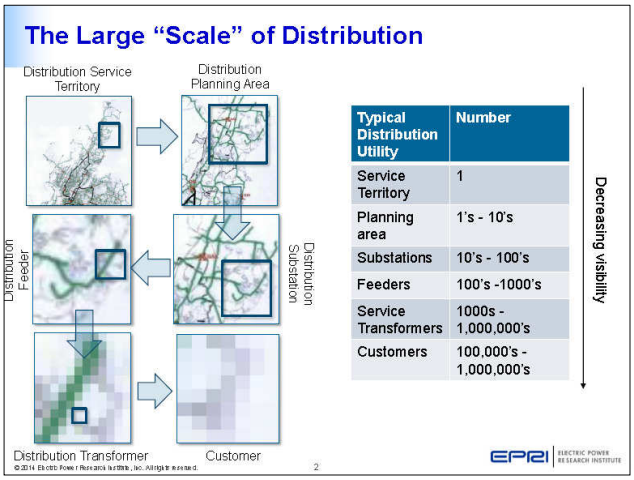
Integration Capacity Analysis Scale

CA IOUs have about 9000 distribution circuits that need to be assessed for DER integration capacity



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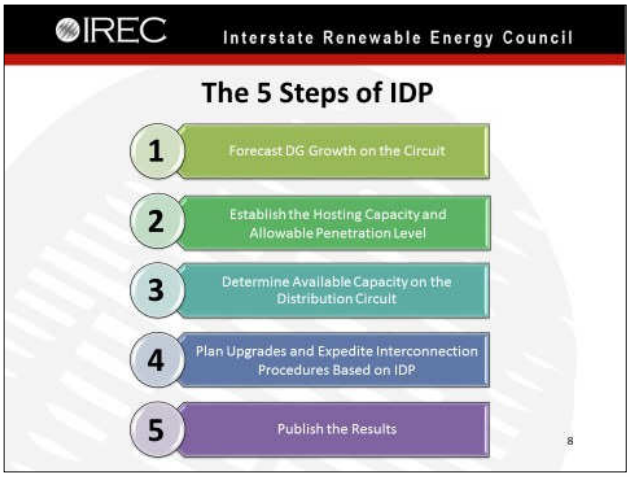
Integration Capacity Analysis Process

Adaptation of the IREC Process for DER Integration Capacity Analysis



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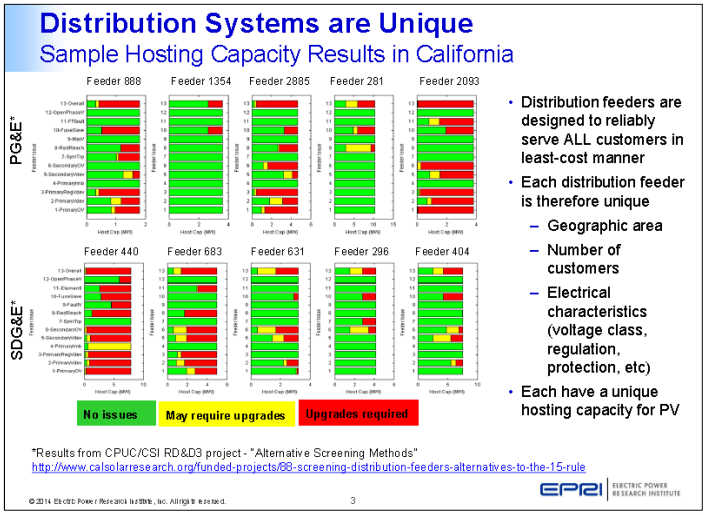
Integration Capacity Analysis



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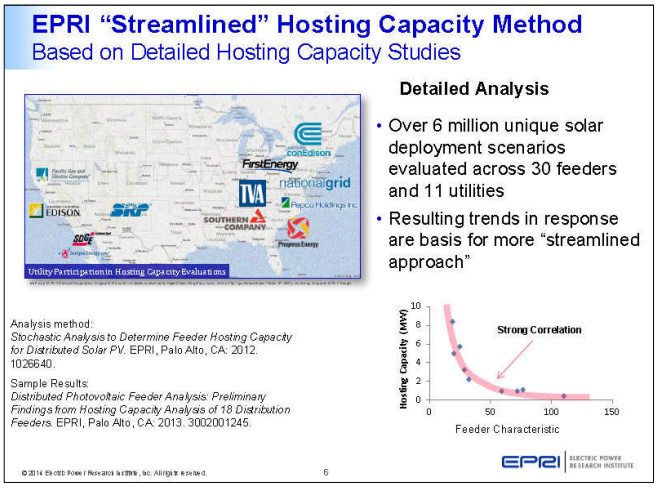
Integration Capacity Analysis

Adaptation of the EPRI Methodology for DER Integration Capacity May be Effective



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Locational Benefits Analysis Framework

Currently under discussion

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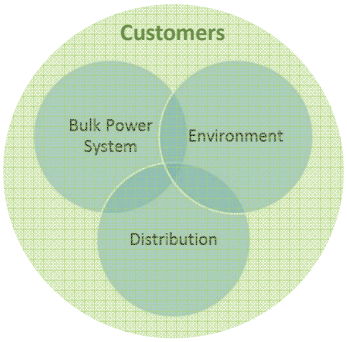
Optimal Locations

What are the attributes of locational benefits?

- How do we model how effective each benefit of DER is?
- How do we look at this over time to account for dynamic, flexible benefits rather than static benefits?
- Should the geographic area be constrained locally or relaxed to allow for system wide benefits?

Customer Net Benefits may be derived from several places:

- Distribution level benefits: Deferred/Avoided Capital Investment, Power Quality (Volt/Var & harmonics), Asset Utilization
- Bulk power systems benefits: Deliverability, Resource Adequacy, Voltage & Frequency support, Deferred/Avoided Capital Investment, Reduced Losses
- Environmental benefits: GHG reduction, air quality, environmental justice



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Optimal Location Analysis

Optimization analysis based on values derived from *cost minimization* across:

- **Planning objectives**
  - Reliability
  - Environmental
  - Policy goals
  - Safety
  - Load serving capacity
  - Asset utilization
  - Affordability and cost objectives
  - Resiliency and cyber security
  - Customer choice
  - Streamlined interconnection processes
- **Societal objectives**
  - Environmental
  - GHG and local area emissions
  - Water-energy nexus
  - Environmental Justice
  - Low income access to reliable power
  - Resiliency impacts
  - Ease of access
  - Job Creation
  - Transportation electrification
  - Regulatory certainty
- **System Constraints**
  - Thermal Limits
  - Existing system capacity
  - Operating flexibility
  - Assets and their depreciation/age
  - Institutional constraints
  - Technology constraints
  - System stability
  - Limits of steady-state analysis
  - Inability to account for uncertainty
  - Protection
  - Power Quality (voltage, etc)

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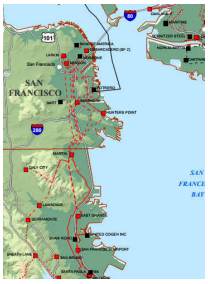
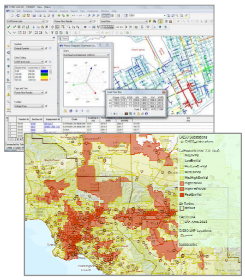
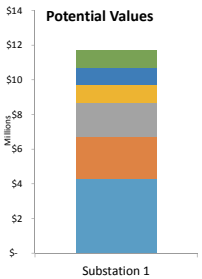
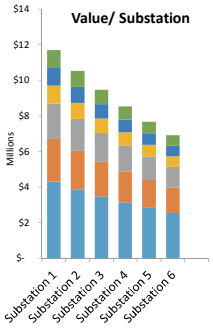
Optimal Location Analysis Process Currently Under Discussion

Identify DPA & Related Substations → Perform Planning Analyses → Calculate Potential Values (Benefits) → Rank Substations by Total Value









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Optimal Location & Values: Studies/Methods Considered

- EPRI – Integrated Grid Framework – DER Integration Planning Methods (Dec 2014)
- E3 – Net Benefits of NEM in California (2013)
- Rocky Mountain Institute – A Review of Solar PV benefit and Cost Studies, 2nd Edition (2014)
- Integral Analytics – Distributed Marginal Price (2014)
- Brattle – Value of Distributed Electricity Storage in Texas (Nov 2014)
- PG&E – Distribution Planning and Investment and Distributed Generation – 2014 GRC Testimony – Appendix C (2013)
- New York – Benefits and Costs (Nov 2014)
- Regulatory Assistance Project – US Experience with Efficiency as a Transmission and Distribution Resource (2012)
- Regulatory Assistance Project – Big Changes Ahead: Impacts of a Changing Utility Environment (2014)
- Regulatory Assistance Project - Designing Distributed Generation Tariffs Well (2014)
- T. Lindel, et al, Integrated Distribution Planning Concept Paper, Interstate Renewable Energy Council, Inc. & Sandia National labs, 2013
- E. Gunther, Technical Impact and Business Value of Integration of Photovoltaic Generators in Distribution Systems – Developing an Evaluation Framework, EnerNex, 2014

DER Value Categories (Benefits & Avoided Costs)

Identification of values and related methods is currently under discussion

		Non-Locational Benefits		Locational Benefits			Benefit Accrual	
DER Customer Class	Export v. Domestic	Bulk Power System	Environment	Bulk Power System	Distribution	Environment	Customer	Class
Behind the Meter	Domestic	Capacity		Capacity			X	X
					Capacity			X
				Electricity	Electricity		X	X
		A/S						X
		Ramp/Volatility						X
					Power Quality		X	X
					Resiliance		X	X
				Thermal mgmt	Thermal mgmt			X
				Congestion relief				X
				Avoided Tx				X
		Increased deliverability capabilities						X
						Air Quality		X
			GHG					X
	Export	Capacity		Capacity			X	X
					Capacity			X
				Electricity	Electricity		X	X
		A/S						X
		Ramp/Volatility						X
					Power Quality		X	X
					Resiliance		X	X
				Thermal mgmt	Thermal mgmt			X
				Congestion relief				X
				Avoided Tx				X
		Increased deliverability capabilities						X
						Air Quality		X
			GHG					X
Large Scale DER	Export only	Capacity		Capacity				X
					Capacity			X
				Electricity	Electricity			X
		A/S						X
		Ramp/Volatility						X
					Power Quality			X
					Resiliance			X
				Thermal mgmt	Thermal mgmt			X
				Congestion relief				X
				Avoided Tx				X
		Increased deliverability capabilities						X
						Air Quality		X
			GHG					X

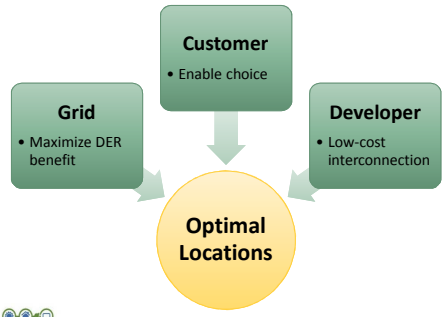
Currently under discussion

Identifying Optimal Locations

Currently Under Discussion

Strategically-sited Distributed Energy Resources can provide additional value to the grid.

- AB 327 requires submittal of a distribution resource plan proposal to identify optimal locations for the deployment of distributed resources
- Existing public interconnection maps (Fig. 1) will be refined and expanded to better facilitate strategic project siting
- New layers may provide data on potential system benefits, future projects to alleviate constrained areas, etc.
- A formal process for updating and maintaining data based on interconnection and planning processes will be established



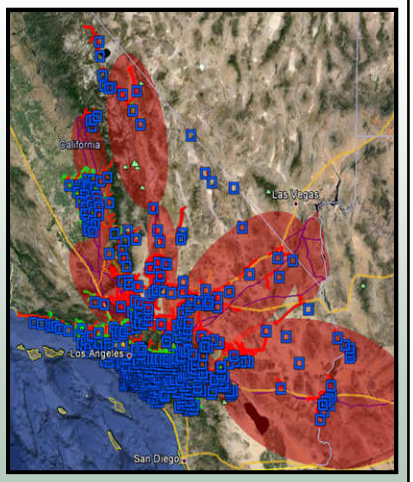


Figure 1: Interconnection Map Overview

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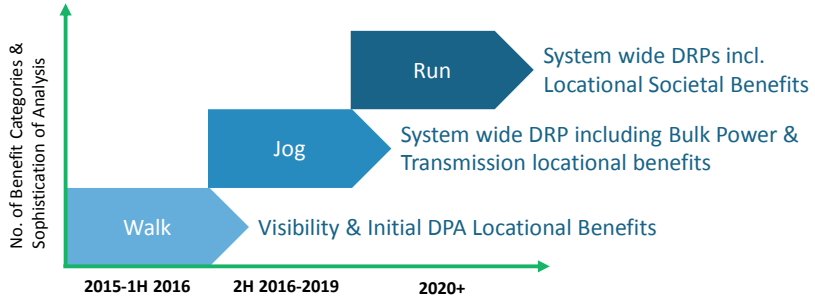
Evolution of DRP Optimal Location Benefits Analysis

Currently Under Discussion

Range of values will require increasing more sophisticated analysis and capabilities to properly assess and operationalize.

An evolution over next 5 years is seen as a practical means to make progress toward the objectives of 769 system wide and with DER adoption at large scale



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